

# Environment-Friendly Ethanol Makes Its Debut at Berkeley Lab

With the addition of a 4,000-gallon fuel tank in the motor pool, Berkeley Lab this month became the first ethanol dispensing station in Northern California.

This cleaner-burning, high-octane, environmentally friendly alternative to gasoline will soon power 60 vehicles in the Laboratory's on-site pool, the largest ethanol-powered fleet in the state.

"By the end of this year, our flex-fuel fleet – those that are capable of using unleaded fuel and/or ethanol 85 – will grow to about 75," said Don Prestella, the Lab's fleet manager. "It is our goal to run all of them exclusively on ethanol."

"E-85" is a blend of 85 percent ethanol, a renewable biofuel called ethyl alcohol made from grain, like corn, and 15 percent gasoline.

Converting grain to ethanol helps offset carbon emissions from fossil fuels, and vehicles that use it produce 25 percent less carbon monoxide and nitrogen oxide emissions.

Berkeley Lab has become one of about 150 E-85 fueling stations now in operation in more than 20 states. The transi-



Don Prestella pumps some ethanol into one of the Lab's vehicles.

tion means that the Laboratory meets its alternative-fuel target for reduced air emissions established in 1999 by Executive Order for all federal facilities.

Science on the Hill is produced by the Berkeley Lab Public Affairs Department.

Editor: Lyn Hunter (510)486-4698

Community Relations: Terry Powell (510) 486-7292

Education Outreach: Rollie Otto (510) 486-5325

Berkeley Lab is managed by the University of California for the U.S. Department of Energy.

Non Profit Org.  
U.S.Postage  
PAID  
Sacramento, CA  
Permit No. 837



# Science on the Hill

The Community Newsletter of Berkeley Lab

Summer 2004

## Students Spend Summer Vacation Studying Science

Those who think teenagers prefer to while away their summers lounging by the pool, frolicking at the beach, and going to the movies might be surprised by a select group of young adults spending their summer break at Berkeley Lab, learning about things like nanotechnology, energy efficiency, and biotechnology.

Forty-four talented juniors and seniors — more than half from the Bay Area — will be interning at the Lab this summer, as part of the High School Student Research Participation Program. The program is administered by the Lab's Center for Science and Engineering Education (CSEE).

The interns come from high schools in Oakland, Berkeley, West Contra Costa County, Vallejo, and other locales throughout California.

"We have some incredibly talented young people in our schools hungry for real world experience in science," says CSEE head Rollie Otto.

The interns were selected based on their academic performance, statements of interest, and references from their teachers. In fact, many of the teachers who recommended their students have themselves participated in Lab-sponsored teacher-education programs.



Jennifer Guzman, from Richmond High School, helps Lab scientists decode and analyze the DNA sequence of the fruit fly.

lege and careers in the sciences."

In addition to high school students, the Lab will also host nearly 100 college undergraduate students, five of whom interned at the Lab when they were still in high school. Jonah Van Borg, for example, helped build a laser at the Lab's Advanced Light Source as a high school intern, and will be back again this summer, during a break from his studies at Columbia University.

Of course, the Lab's education outreach isn't limited to the summer months. CSEE hosts programs and events throughout the year for younger students as well. This past year, over 600 fifth and sixth graders visited the Lab to learn about such topics as the structure of matter and thermal energy. The workshops complement the state's standards for science curriculum. The Lab also hosted 16 teams from local high schools as part of the regional competition for the National Science Bowl (see story on page 2).

And as mentioned before, Bay Area teachers also get in on the act, through the Lab's Science Teacher Professional Development Program. Participants update their knowledge of science and technology, then transfer these experiences to the classroom. They also receive professional support from Lab liaisons throughout the school year.

For more information about CSEE and its outreach programs, visit its website at [www.lbl.gov/Education/CSEE](http://www.lbl.gov/Education/CSEE).

## New Director Named for Berkeley Lab



Steven Chu, a physics professor at Stanford University and Nobel Prize winner, has been named as the next director of Berkeley Lab. He replaces Charles Shank, who is retiring after 15 years at the helm. Chu will officially assume his new duties on August 1. "I am thrilled to see a person of his stature take over the reins," said Shank.

Steven Chu, a physics professor at Stanford University and Nobel Prize winner, has

Lab scientists, engineers and professionals will teach students about the work they do, covering such fields as computational research, life sciences, earth sciences, and astrophysics, as well as communications and facilities management.

"It is our hope that some of these high school students will return to Berkeley Lab as employees some day," says Reid Edwards, head of the Lab's Public Affairs Department, which oversees CSEE. "But even if that doesn't happen, this kind of educational outreach will help prepare them for col-



## Lab Hosts High School Science Bowl; Harker Edges Albany Team

It was a David-and-Goliath script, and as happened in that famous battle, David won again. This time, the scene was the East Bay’s regional Science Bowl competition, which returned to Berkeley Lab in April after many years’ absence. A field of 16 local high school teams spent one Saturday answering difficult questions in astronomy, biology, chemistry, math, earth and computer sciences. Lab volunteers read the questions, kept score and time, and shuttled teams from room to room for new matches every 15 minutes.

When the dust settled in the afternoon, only two teams remained – Albany High, a multiple winner of regional contests plus the 1993 national championship, and Harker School of San Jose, which has been a high school for only six years and never got past the first round of the Science Bowl regionals before this year.



Berkeley Lab Deputy Director Sally Benson bestows a medal upon Harker captain Mason Liang.

The two had met earlier in the day and split their matches. But in the final, the young upstart upended the grizzled veteran, 136-72. Proving it was no fluke, Harker went on to Washington D.C. and, against 65 other teams from across the country, finished in the top 16.

“These students are fearless,” Harker coach Robbie Korin said of his winning team – Lev Pisarsky, Anjali Vaidya, Mason Liang, Yi Sun, and Jasper Shau.

Albany’s runner-up squad, impressive as usual, included Peter Collister, Richard Gong, Wendy Gu, Xuan Luo, Jianing Jenny Lu, and Kenneth Carlock. Their teacher-coach was Peggy Carlock.



Members of Albany High’s team ponder a question asked by Berkeley Lab scientists during last April’s Science Bowl regional competition. They came in second place.

## Lab Energy Teams Help ‘Rebuild’ Homes Throughout Berkeley



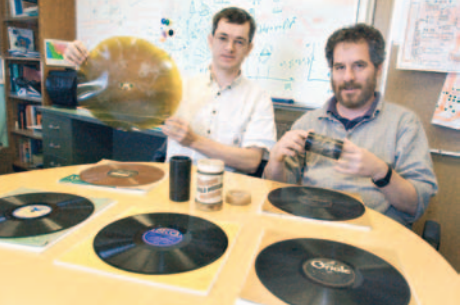
Lab employees install a water heater blanket for an elderly resident in West Berkeley during “Rebuild Together,” held on April 24.

Every year, volunteers across the country pitch in for “Rebuilding Together,” a volunteer program that, every April, makes improvements to the homes of low-income seniors and people with disabilities, as well as community facilities.

On April 24, 17 volunteers from the Lab formed “Energy Teams” that fanned out across Berkeley to set up efficiency measures in about 28 homes. Comprised of five to six people each, these teams installed blankets around water heaters, weather stripping, compact fluorescent lamps, low-flow showerheads, and caulking around windows, among other measures, to reduce energy and water bills.

The Energy Teams concept was created in 1999 by post-doctoral fellow Lisa Gartland, who worked in the Lab’s Environmental Energy Technologies Division. Today, Energy Teams operate in the Berkeley and San Francisco areas. It is estimated that nearly 3,500 homes were rehabilitated across the country during this national event.

## Scientists Use Physics to Help Preserve Rare Audio Treasures



Vitaliy Fadeyev (left) and Carl Haber.

The 1995 discovery of the top quark and singer Marian Anderson’s 1947 rendition of *Nobody Knows the Trouble I’ve Seen* may seem unrelated. But through an interagency agreement with the Library of Congress, the same technology used to study subatomic particles is helping to restore and preserve the sounds of yesteryear.

“We developed a way to image the grooves in a recording that is similar to measuring tracks in a particle detector,” says Carl Haber, a senior scientist in Berkeley Lab’s Physics Division who developed the technology along with fellow scientist Vitaliy Fadeyev.

Their work could ultimately enable the Library of Congress to digitize the thousands of blues, classical, Dixie, jazz, and spoken word recordings in its archives. The mass digitization of these aging discs and cylinders will both preserve the nation’s musical history and make it accessible to a wide audience.

The collaboration takes advantage of Berkeley Lab’s decades of experience developing ways to analyze the flood of data generated by high energy physics experiments. This work, conducted at accelerators located at Fermilab and the European Center for Particle Physics, requires the ability to image the tracks made by elementary particles as they hit detectors, and find these tracks amid a jumble of meaningless noise. “We thought these methods, which demand pattern recognition and noise suppression, could also analyze the grooved shapes in mechanical recordings,” says Haber.

## Stemming the Scourge of Malaria, Synthetically

Berkeley Lab researchers are developing a simple and much less expensive means of making one of the most promising and potent of all the new antimalarial drugs.

By adding new genes and a new metabolic pathway in *E. coli* bacteria, the researchers can quickly and cheaply synthesize a precursor to the chemical compound artemisinin. This next generation antimalarial drug is effective against strains of the malaria parasite resistant to the current front-line drugs, but is far too expensive for the countries in Africa and South America where it is needed most.

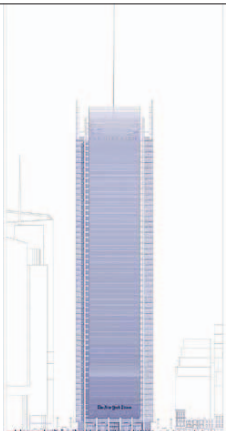
“We’re mixing different genes from different organisms in order to do new chemistry inside living cells,” says chemical engineer Jay Keasling. “The goal is to produce new drugs for fighting disease or combating bioterror agents, or to produce existing drugs in better ways.”

Keasling heads Berkeley Lab’s new Synthetic Biology Department, which aims to design and construct novel organisms and biologically inspired systems that can solve problems natural biological systems cannot. Malaria is one of those problems. Each year nearly 500 million people living in the tropics and subtropics become infected with malaria, and nearly three million — mostly children — die.



Jay Keasling is working to create a powerful antimalarial drug.

## Lab Helps Make New York Times Headquarters More Energy Efficient



In 2003, planners from the New York Times Company visited Berkeley Lab’s Environmental Energy Technologies Division (EETD) to talk about making buildings energy-efficient, comfortable, and productive places to work. They were shopping around for energy-efficient technologies for the new home of the New York Times, its first headquarters office building since the current one was built in 1913. The transparent glass tower, 52 stories high (left), will overlook the Times Square Redevelopment area.

The group spent a day with EETD learning about the Lab’s research in commercial buildings energy efficiency, glazing, daylighting, lighting, and thermal comfort. As a result of that visit, the New York Times Company and EETD began a cooperative research project to test energy-efficient technologies for daylighting the building’s interior that also improve the indoor environment for the comfort of its occupants.

The research program focuses on reducing electric lighting energy use through daylighting, while controlling glare and cooling loads in this highly glazed building. Researchers are testing alternative hardware and control solutions in a newly constructed, 4,500-square foot mockup of a portion of the building.